LARGE VERTICAL ARRAYS (LVA's) FOR 6M CONTESTING

LARGE VERTICAL ARRAYS FOR 6M CONTESTING

CREDIT DAVE OLEAN-K1WHS FOR THIS IDEA

FIRST PRESENTED AT THE CENTRAL STATES CONFERENCE IN 2006??

THE IDEA IS TO STACK SEVERAL SHORT BOOM ANTENNAS UP A TOWER LEG

THIS GIVES GOOD GAIN WITH A VERY WIDE AZIMUTH PATTERN

LARGE VERTICAL ARRAYS FOR 6M CONTESTING

WHY AN LVA?

1. SHORT YAGIS MEANS A WIDE BEAMWIDTH

2. NO ROTATING NECESSARY—NOTHING OUTRUNS A SWITCH

3. HIGHER GAIN THAN A SINGLE LONG YAGI

LARGE VERTICAL ARRAYS FOR 6M CONTESTING

WHY AN LVA?

4. CONSTRUCTION IS SIMPLE AND CHEAP

5. MOUNTING TO THE TOWER IS SIMPLE USE THE SUPPORT STRUCTURE THAT YOU ALREADY HAVE

6. WITH THE RIGHT DESIGN, MATCHING IS STRAIGHTFORWARD

LARGE VERTICAL ARRAYS FOR 6M CONTESTING

THE DESIGN FOR A SINGLE YAGI WAS DONE BY MIKE-W5UC(NOW SK) USING EZ-NEC+

I AM AN EZ-NEC+ NEWBIE SO, CAVEAT EMPTOR

THE DESIRE WAS TO HAVE FOUR REAR MOUNTED 3EL BEAMS STACKED ON A TOWER LEG SPACED 10FT APART, AT 20, 30, 40, 50FT HIGH. THIS GIVES AN EFFECTIVE ARRAY HEIGHT OF 35FT

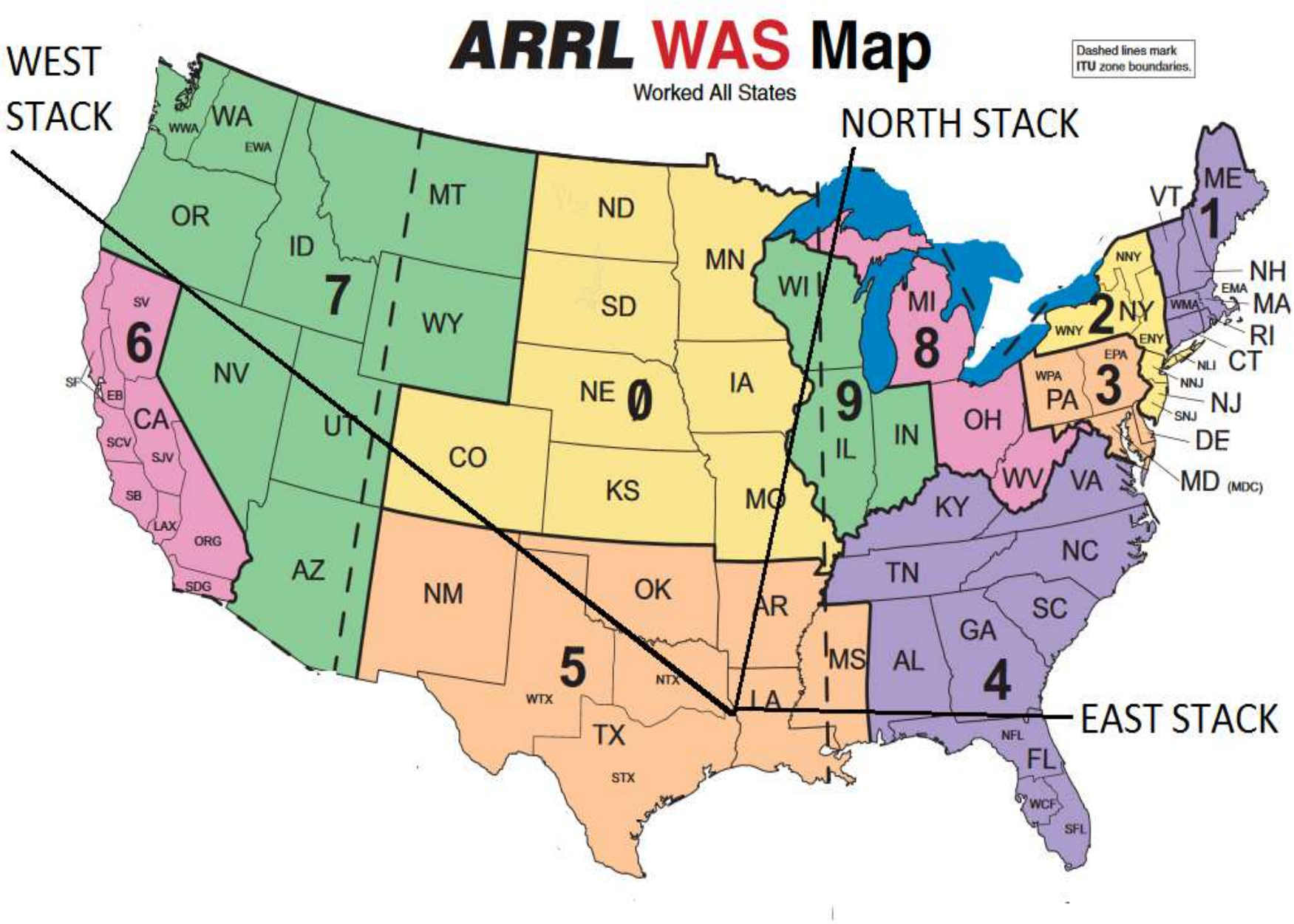
THE WESTERN STACK-NOTE THE PHILLYSTRAN TRUSSES

LARGE VERTICAL ARRAYS FOR 6M CONTESTING

A SINGLE 3EL YAGI HAS A 3db BEAMWIDTH OF APPROXIMATELY 60DEG AND A 10db BEAMWIDTH OF APPROXIMATELY 110DEG

VERTICALLY STACKING 4 OF THEM STILL HAS A 58DEG PATTERN IN AZIMUTH @7DEG EL AND A 10db BEAMWIDTH OF ABOUT 110DEG

GAIN IS 18+dbi = 16dbd, EQUIVALENT TO A M2 6M9KHV WHICH COSTS $1000+ AND ARE BIG, HEAVY, AND UNWIELDY


ARRL WAS Map
Worked All States
Dashed lines mark ITU zone boundaries.
WEST STACK
NORTH STACK
EAST STACK
WA
WWA
EWA
OR
ID
MT
ND
MN
SD
WY
NE
IA
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SV
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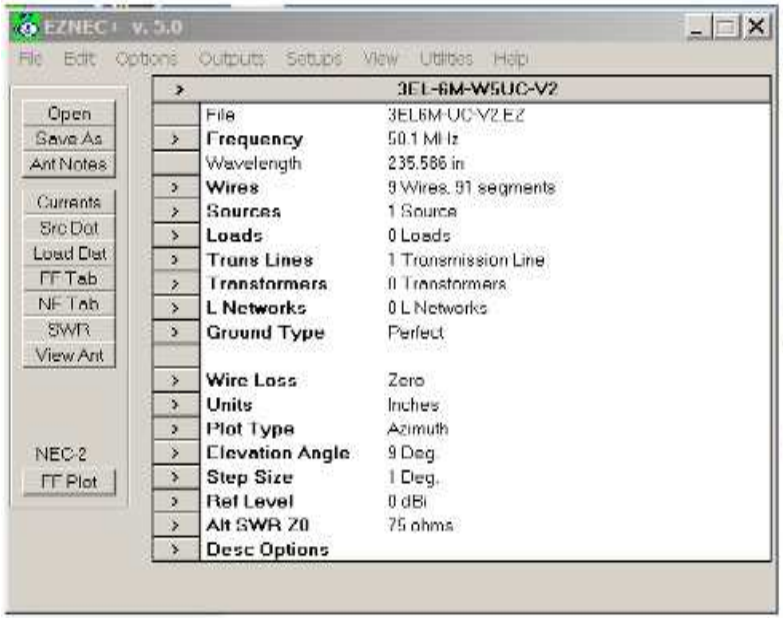
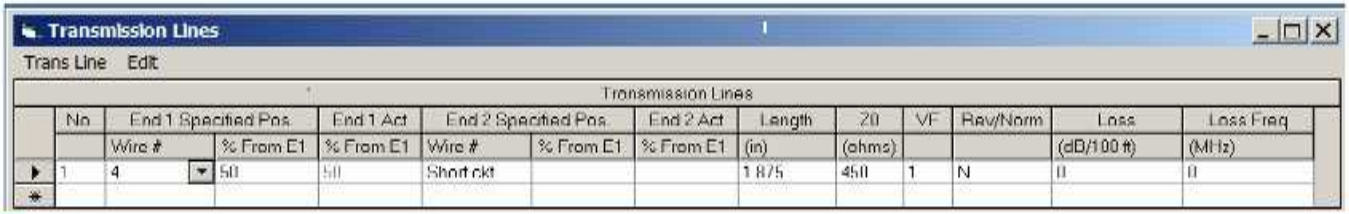
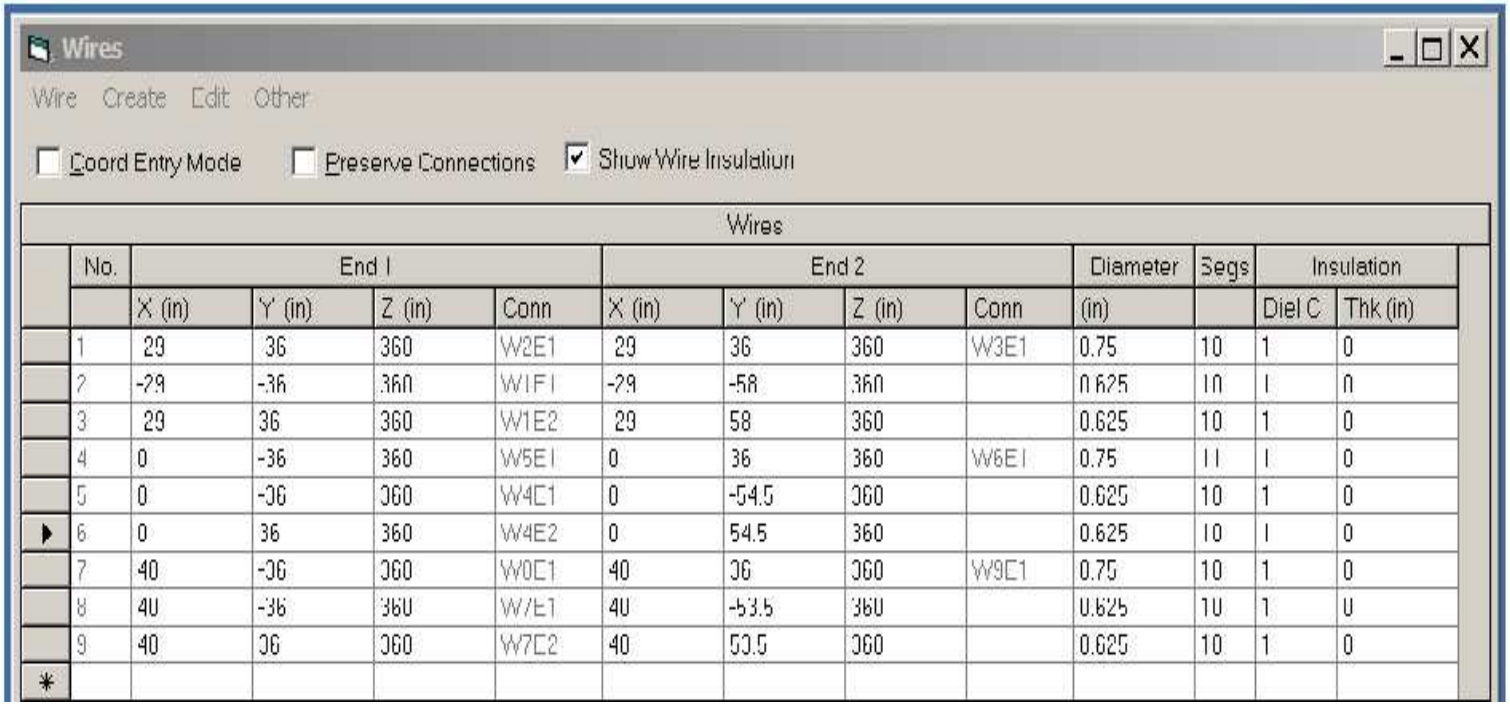


DETAILS OF EZ-NEC TABLES
WIRES CHART
TRANSMISSION LINES CHART

REFLECTOR = 116" TOTAL
DE = 109" TOTAL
DIRECTOR = 107" TOTAL
CENTER OF ALL ELEMENTS IS A 3/4" Al TUBING 6FT LONG
ELEMENT ENDS ARE 5/8" Al TUBING TO CORRECT LENGTH



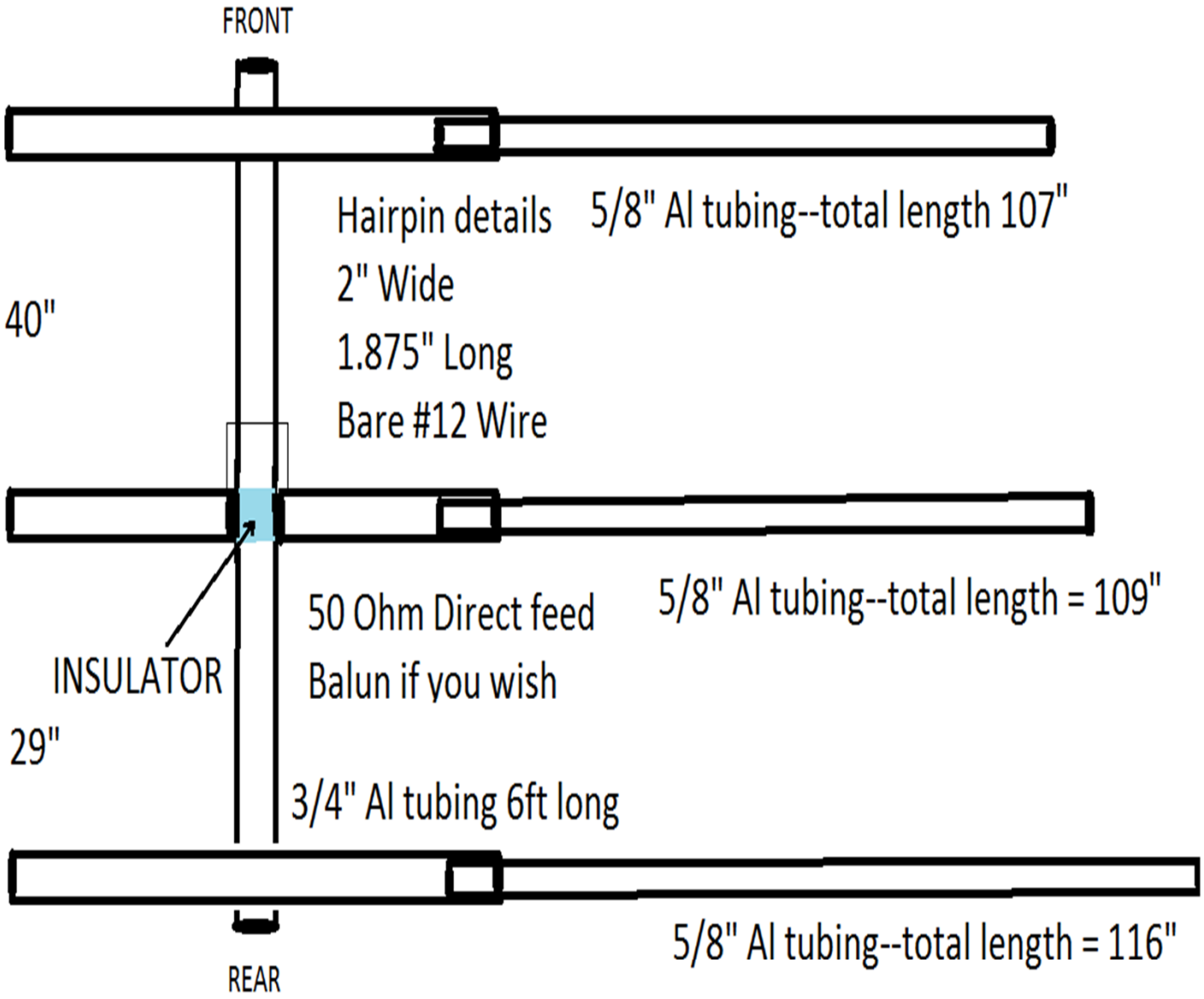
No.	End 1 Specified Pos.		End 1 Act	End 2 Specified Pos.		End 2 Act	Length	Z0	VF	Rev/Norm	Loss	Loss Freq
	Wire #	% From E1	% From E1	Wire #	% From E1	% From E1	(in)	(ohms)			(dB/100 ft)	(MHz)
1	4	50	50	Short ckt			1.875	450	1	N	0	0



No.	End 1				End 2				Diameter	Segs	Insulation	
	X (in)	Y (in)	Z (in)	Conn	X (in)	Y (in)	Z (in)	Conn	(in)		Diel C	Thk (in)
1	29	36	360	W2E1	29	36	360	W3E1	0.75	10	1	0
2	-29	-36	360	W1F1	-29	-58	360		0.625	10	1	0
3	29	36	360	W1E2	29	58	360		0.625	10	1	0
4	0	-36	360	W5E1	0	36	360	W6E1	0.75	11	1	0
5	0	-36	360	W4C1	0	-54.5	360		0.625	10	1	0
6	0	36	360	W4E2	0	54.5	360		0.625	10	1	0
7	40	-36	360	W0C1	40	36	360	W9E1	0.75	10	1	0
8	40	-36	360	W7E1	40	-53.5	360		0.625	10	1	0
9	40	36	360	W7C2	40	53.5	360		0.625	10	1	0

CONSTRUCTION DETAILS

LEFT SIDE IS MIRROR OF THE RIGHT
SPLIT DIPOLE HAS 1" INSULATOR
HAIRPIN DETAILS: 2" WIDE
1.875" LONG, BARE #12 WIRE
ELEMENT EXTENSIONS CAN BE SECURED WITH HOSE CLAMPS (ADJUSTABLE) OR WHEN YOU ARE SURE OF THE DESIGN, A SHEET METAL SCREW OR POP RIVET
THIS DESIGN IS VERY FORGIVING OF SMALL CONSTRUCTION ERRORS, JUST TRY TO KEEP THEM SMALL

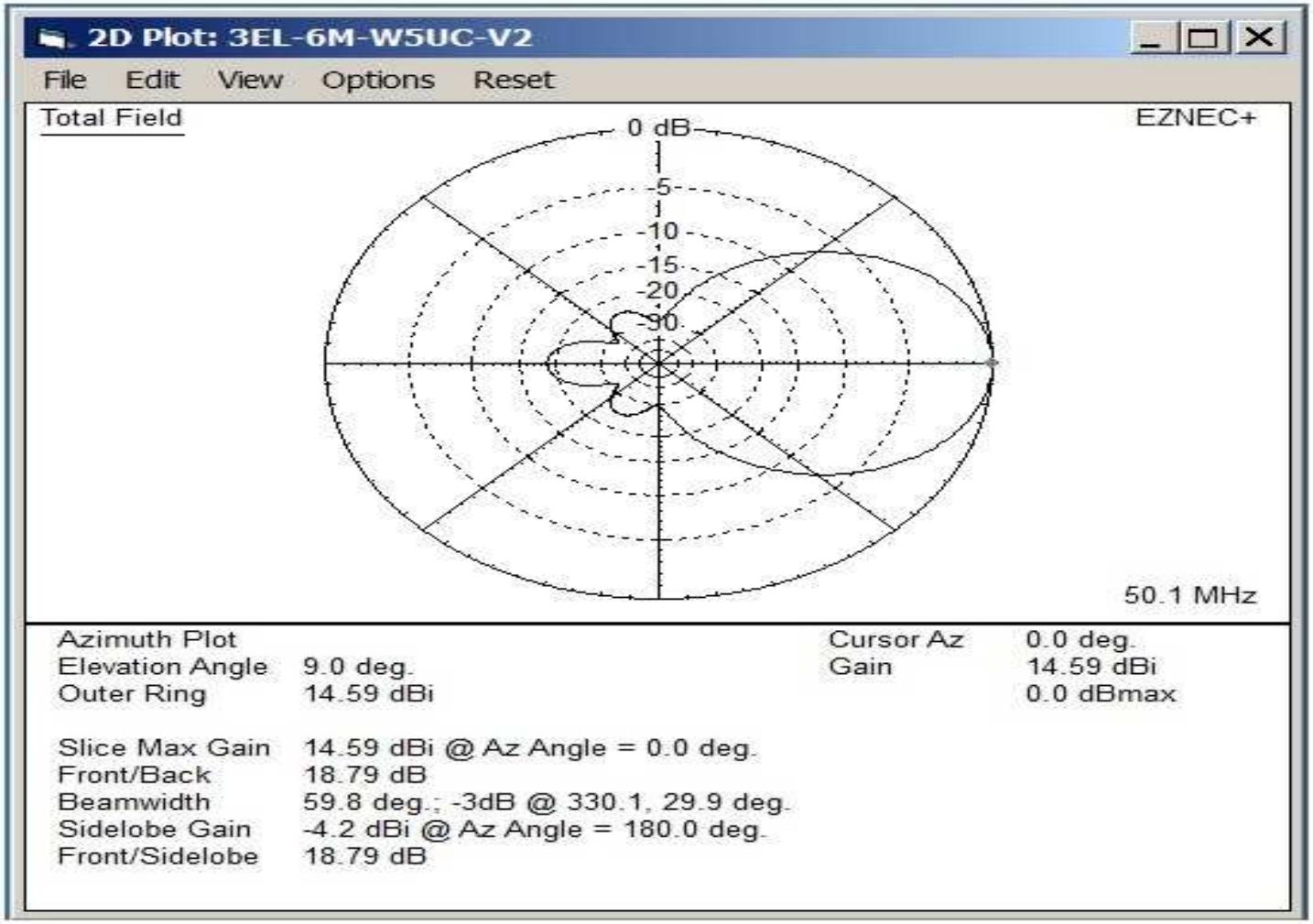


WHOLE ANTENNA-BOOM IS 12FT OF 1 1/2” AI TUBING

DETAILS OF ELEMENT MOUNTING

DETAILS OF SPLIT DIPOLE

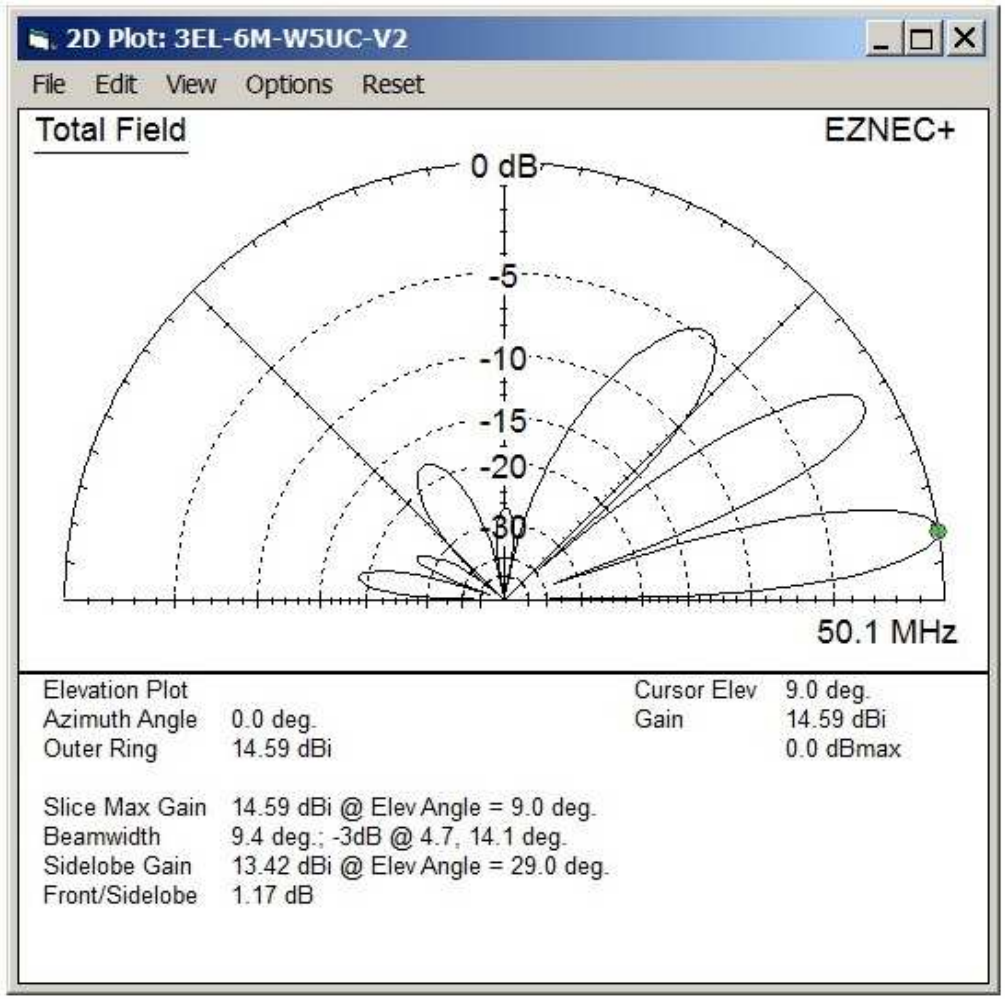
AZIMUTH PATTERN OF 3EL BEAM



3db Beamwidth = 60deg

10db Beamwidth = 110deg(estimated)

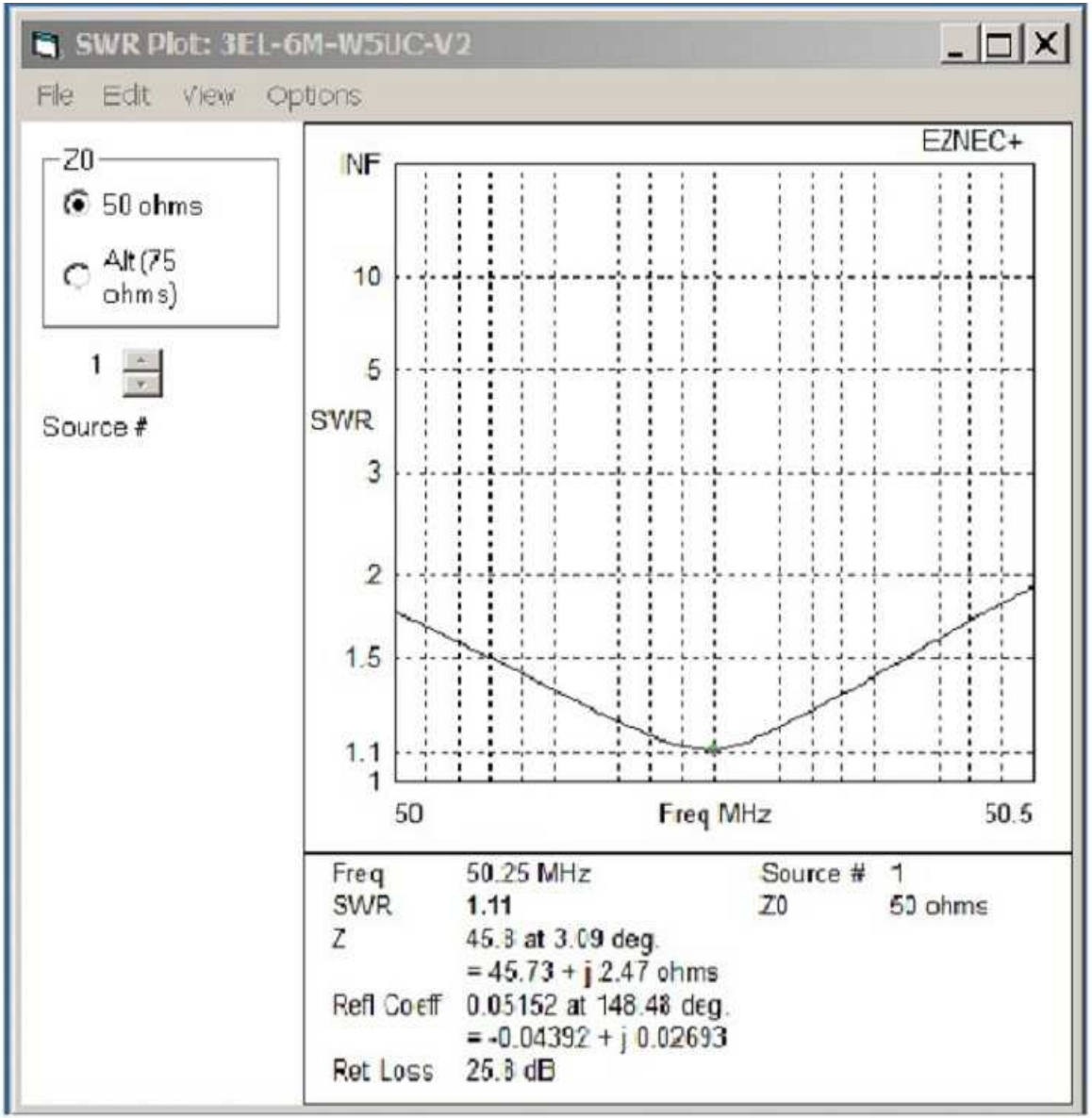
ELEVATION PATTERN OF 3EL BEAM



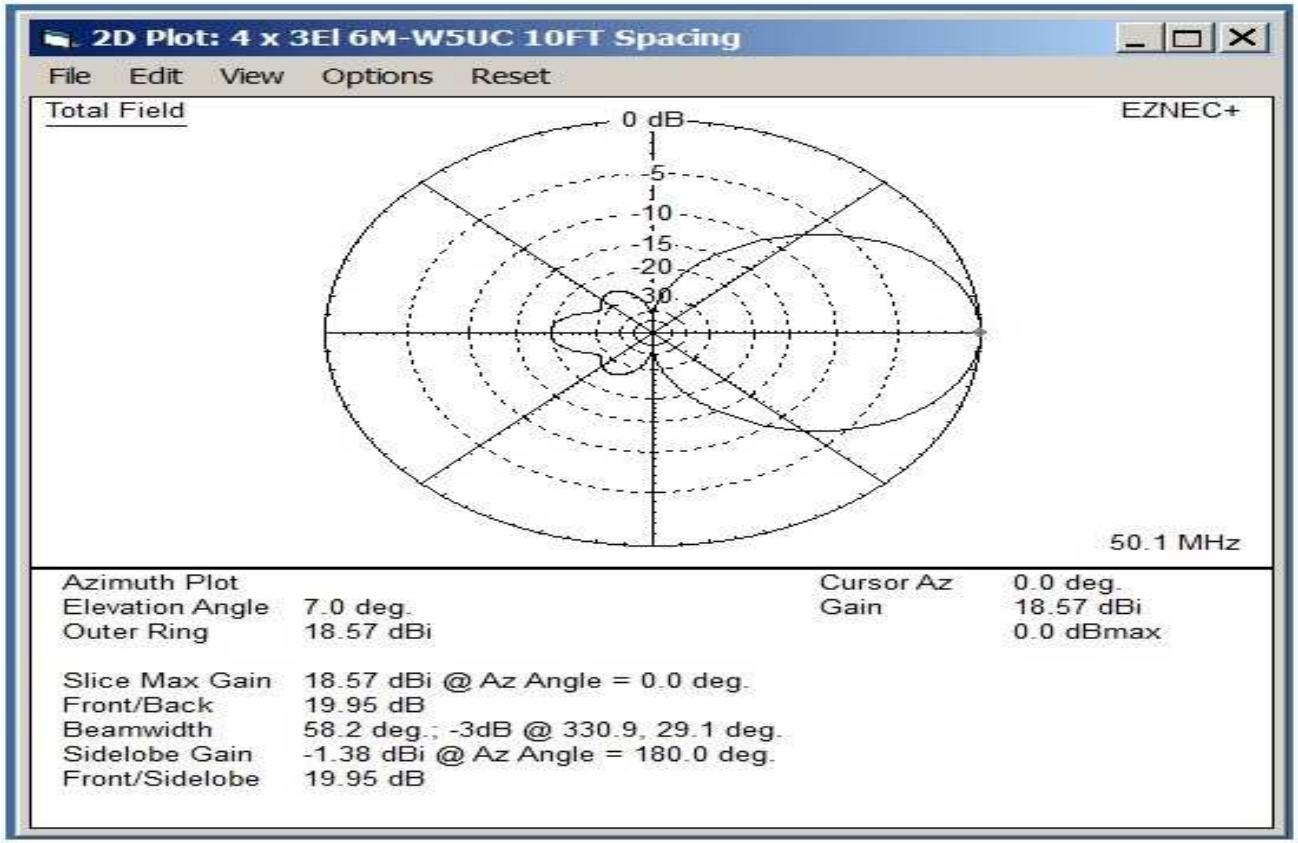
Gain = 14.6 @ 9 deg

Gain = 13.4 @ 20deg

SWR PLOT FOR THE 3EL BEAM



NOW LETS LOOK AT QUAD STACKS OF 3EL BEAMS

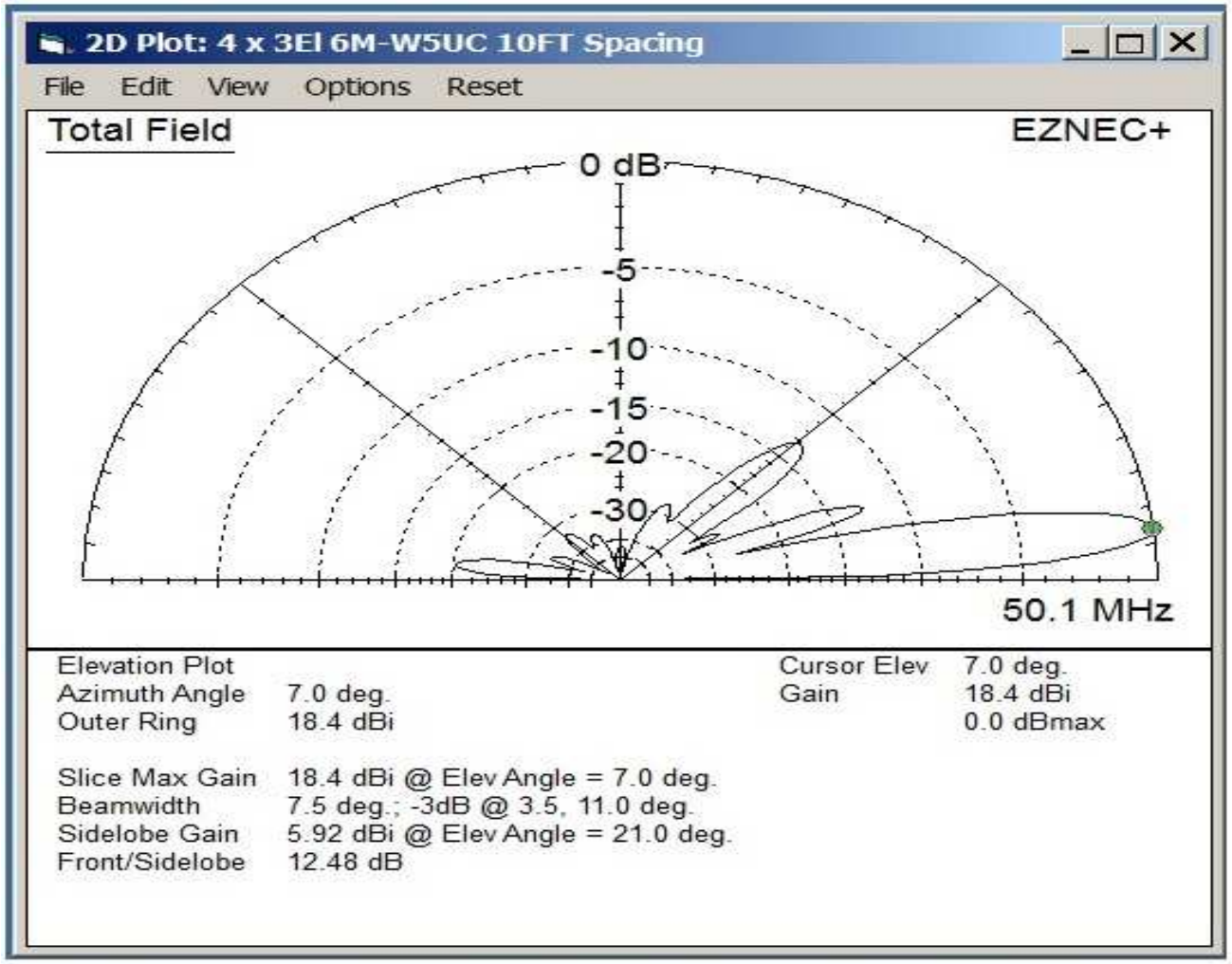


Gain now 18.4dbi @ 7deg of elevation

3db Beamwidth = 58deg

10db Beamwidth = 110deg(estimated)

NOW LETS LOOK AT QUAD STACKS OF 3EL BEAMS



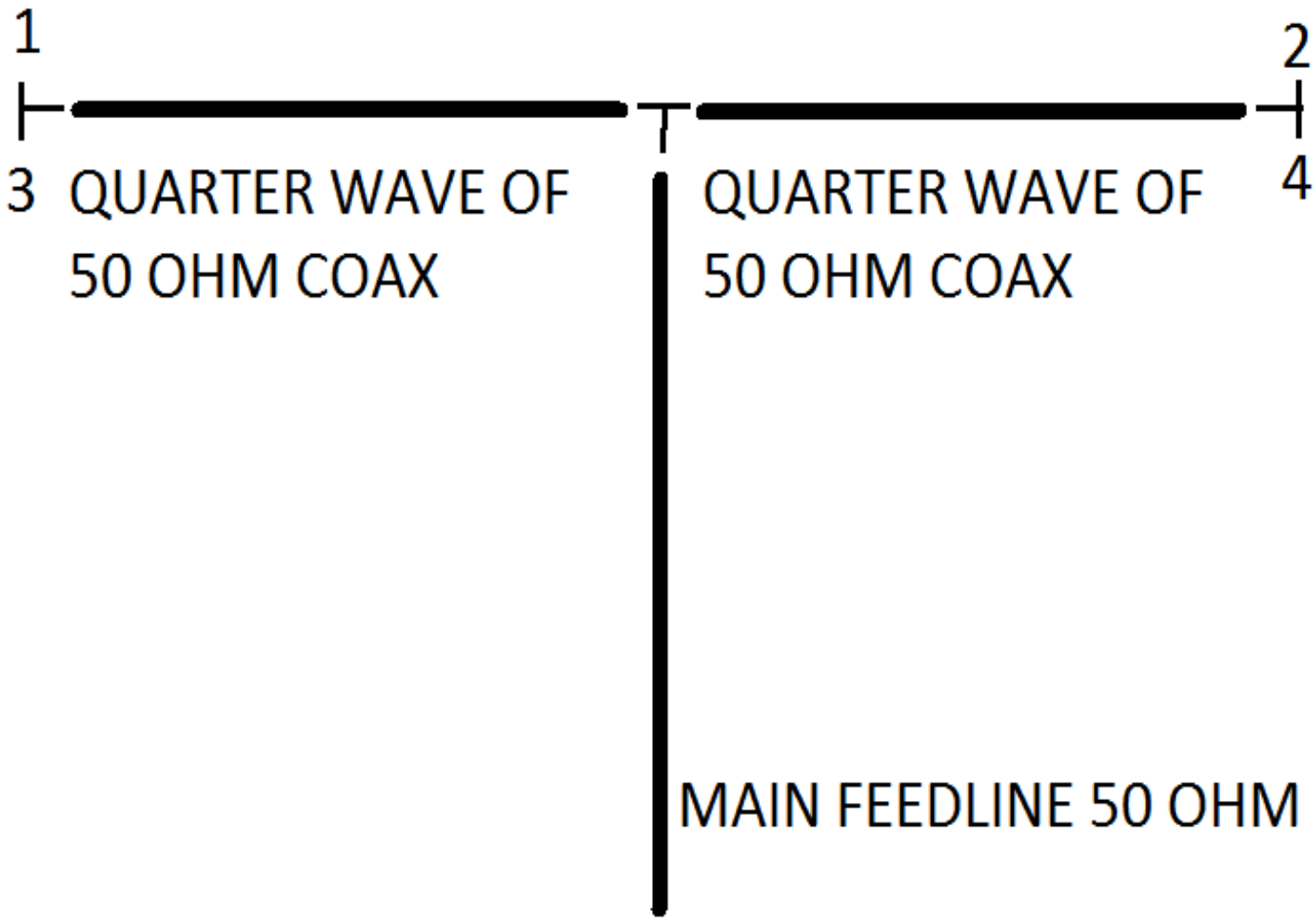
Gain now 18.4dbi @ El angle of 7deg

Still has 5.9dbi @ 21deg

HOW DO WE MATCH THIS?

- Everyone knows that to match 4 each 50Ω antennas you can build a 4 port power divider using only T connectors and 50Ω coax.
- It is easiest if the T connectors are all Female
- You must use two quarter wave sections of 50Ω coax and three T connectors.
- You can use any good quality coax for this, LMR-400, 1/2” Superflex, or 1/2” Heliax will work well here. I had lots of Male Superflex connectors, so I used that(FSJ4-50B).

MATCHING 4 50Ω LOADS TO 50Ω



WHAT ABOUT THOSE QUARTER WAVE SECTIONS?

- Remember that we need ELECTRICAL quarter waves rather than physical quarter waves
- Find a physical full wave from the formula L = 300 / F(MHz). The result is in meters.
- So, for 6M, L = 300 / 50.1 = 5.988meters. Which is 235.69 inches.
- So a physical quarter wave length is 58.9 inches. But to get an electrical quarter wave, we must multiply by the velocity factor of the coax. Different coaxes have different velocity factors.

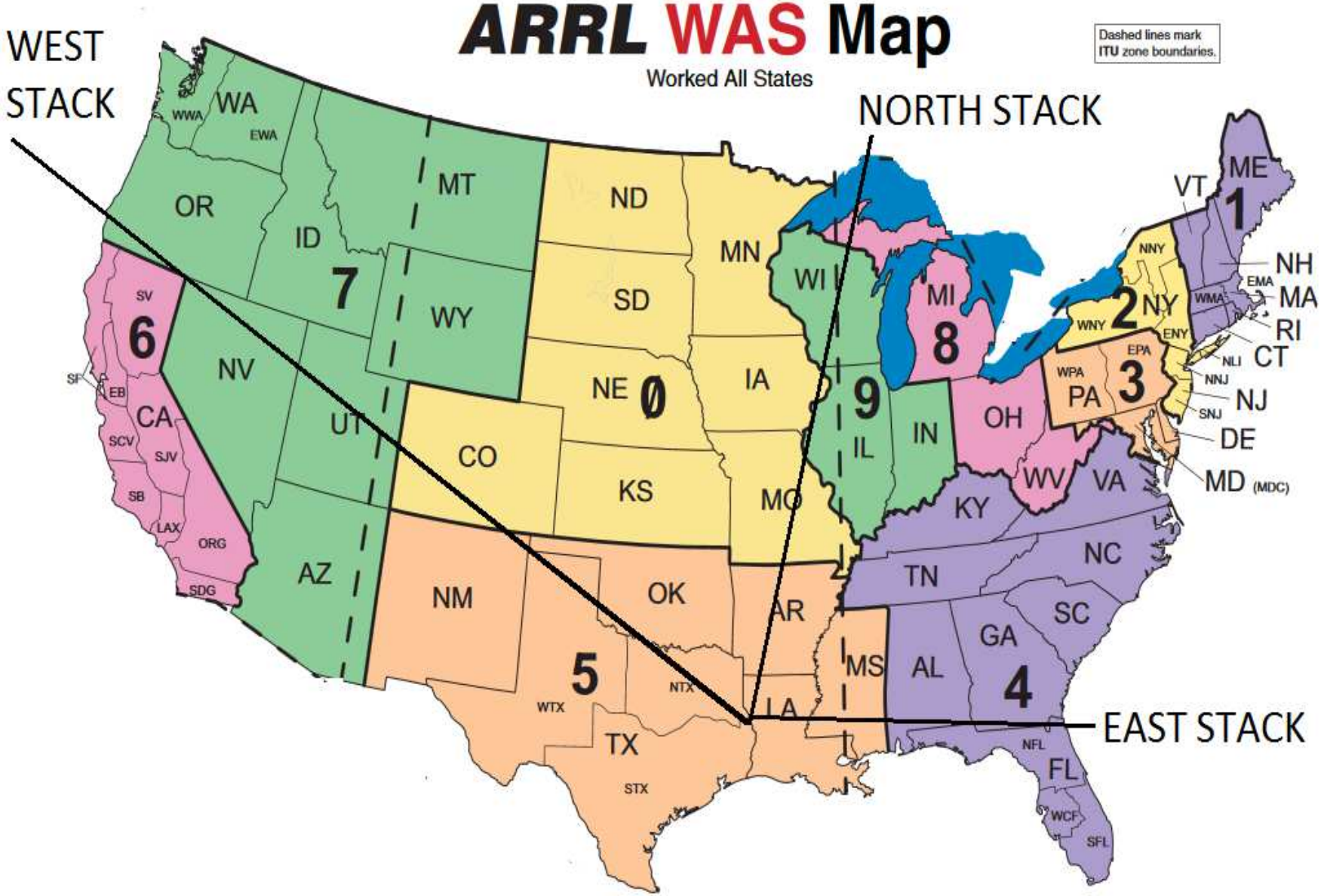
WHAT ABOUT THOSE QUARTER WAVE SECTIONS?

- Hence 58.9” multiplied by the velocity factor gives us the actual length of the coax we need
- Vf of LMR-400 is given as .85 or 85% so we would need 58.9 x .85 = 50” of LMR-400
- Vf of FSJ4-50B is given as .81 or 81% so we would need 47.7” of FSJ4-50B
- Vf of LDF4-50A is given as .88 or 88% so we would need 51.8” of LDF4-50A
- Try to keep errors to a minimum, but these are broadband dividers, so you won't die if you are off a bit.

WHAT ABOUT THOSE QUARTER WAVE SECTIONS?

- Put a connector on one end and then cut the coax to length
- Measure with a VNA or an antenna analyzer
- Remember that the coax connectors affect the length. The Ts add about 3/4” on either side.
- A Type N adds a bit of length(maybe 1/2”??)
- A PL-259 subtracts about 3/4” because of the center conductor sticking out
- Try to get the two lengths to be the same, even if they are not perfect. It will be OK.

REMEMBER THIS?



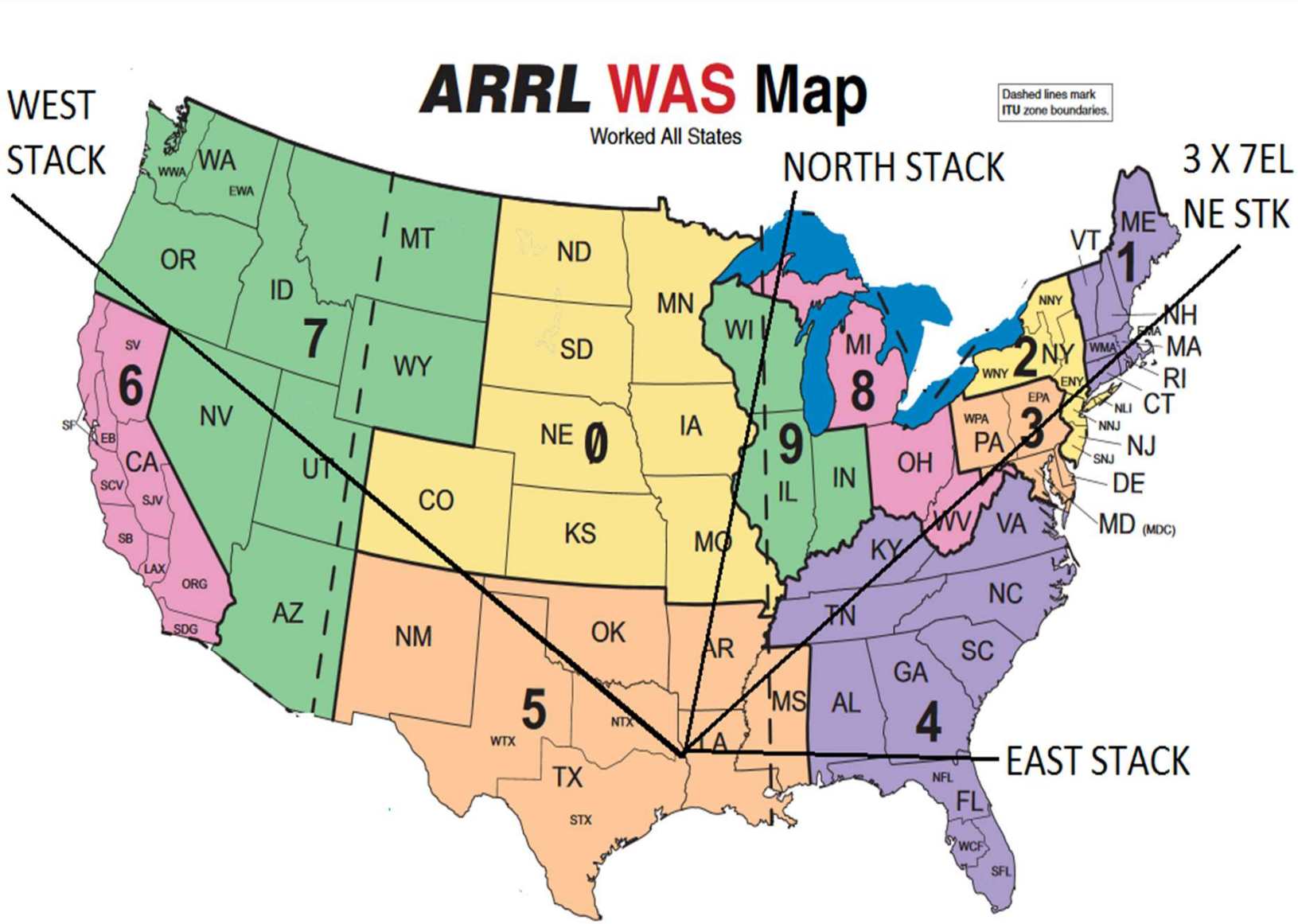
SOMEONE WILL NOTICE THAT THERE IS NO COVERAGE FOR THE “BO-WASH” AREA

MOST OF THE HAMS IN THE US LIVE IN THAT AREA, SO SOMETHING HAD TO BE DONE

WE PUT UP 3 X 7EL POINTED RIGHT AT NNJ, EPA, ALL OF NY, AND EMA. THESE ARE STACKED AT 25, 50, AND 75FT. IT IS A KILLER ANTENNA.

I WILL BE GLAD TO TELL YOU HOW WE MATCHED ALL THIS, BUT OFF LINE

A MAP OF ALL 4 OF OUR FIXED STACKS



QUESTIONS?

- IF WE HAVE PLENTY OF TIME, WE CAN DO A FEW QUESTIONS HERE
- IF WE ARE RUNNING BEHIND, I WILL BE GLAD TO ANSWER ANY QUESTIONS OFF LINE
- IF THAT HAPPENS, YOU ARE REQUIRED TO BUY THE COKES
- 73 de MARSHALL K5QE